

globe. The patient regained her health. In both cases but one eye was affected.

The seventh case is reported by Alf. Pousson in the *Archives d'Ophthalmologie*, tome i. p. 174. In this case, a woman 28 years of age had given birth to a dead child twelve days before she was seen by the reporter. In addition to the irido-choroiditis of the left eye, abscesses developed on the arm and hand. The woman recovered her health, but the eye was of course lost. Micrococci arranged in different forms, especially in the form of a rosary, were found on the eighteenth day of the disease, in the blood and in the pus, from the eye and from the abscesses of the arm and hand.



ARTICLE X.

CASE OF POISONING FROM THE BITE OF A COPPERHEAD (*Ancistrodon contortrix*, Linn.). By H. C. YARROW, M.D. (Univ. Penn.), of Washington, D. C.

THE following history of a case of poisoning from the bite of a copperhead appears to be of some value as showing how very grave the symptoms may be resulting from an injury inflicted by a comparatively small reptile:—

On May 30, 1883, the patient, a photographer by occupation, married, and aged 42 years, in fairly good health, was bitten by a small snake, not over fourteen inches long, on the tip of the middle finger of the left hand. The accident occurred one evening while he was gathering ferns from among some rocks on the left bank of the Potomac River, some distance above the Aqueduct Bridge. While scraping leaves from near the root of a fern, his finger was stung, as he thought, by a bee. Withdrawing his hand hurriedly he discovered clinging to the finger a small copperhead, which had apparently driven in the fangs so great a distance as to be unable to loosen its hold. The patient killed the serpent, but did not take it home, but from the description he gave, and from the fact that he had occasionally killed similar serpents, and knew of their venomous nature, I have no difficulty in believing that the species was *Ancistrodon contortrix*, the common copperhead, which is by no means uncommon on the Potomac above Georgetown. Nor is the case itself unusual, several similar bites having been reported from pretty much the same locality.

After the receipt of the bite the patient drank about half a pint of whiskey, which had no effect whatever upon him; he then proceeded to his home and applied aq. ammonia to the finger, occasionally dipping it in the liquid, and, upon retiring, wet a rag with the same, and wrapped up the injured member. He did not mention to his family the fact of his having been bitten, but during the night remarked to his wife that his finger felt as if he was going to have a bone felon on it. The next day, May 31st, while at work, as he still had uneasy sensations in the finger, he painted it with tinct. of iodine and dipped it in nitric acid, and in the evening applied a bread and milk poultice. The night of the 31st he felt the first sensation of pain creeping up the arm. He had headache, was feverish and nervous; his respiration was increased, and he suffered

from a general feeling of lassitude, with giddiness and nausea. He still remained without medical attendance, nor did he complain to his family of feeling these unpleasant sensations.

June 1st. His finger still pained him considerably, and his condition continued about the same with loss of appetite; his eyes were watering, and he thought the sight somewhat impaired.

2d. The arm became much inflamed on the outer aspect just above the elbow. He now consulted a physician, and told him the history of the case as has been related; but the suggestion of erysipelas was made, the opinion being expressed that the condition could hardly have resulted from the bite of a serpent.

On that evening (Saturday) he was suffering intense pain. At the close of the day's work he went to bed as soon as he reached home, and about an hour after had a chill, followed by slight fever; this was accompanied by pain on the inside of the elbow, extending up the arm to the axilla. In about half an hour a second chill occurred, which was not so severe as the first; the arm then began to swell, and was much inflamed, the pain being so intense as to keep him awake all night. The headache, giddiness, and nausea continued, with weak and watery eyes, all of the next day, which was Sunday; and Monday, as his symptoms seemed to be increasing in severity, he sent for me, this being the fifth day after the injury. His condition was then found to be, according to the record of my case-book, as follows: Face drawn and anxious; complexion clay-coloured; eyes watery; conjunctivæ injected. Tongue pale and furred; pulse small, slow, and weak, beating about sixty to the minute; temperature about normal. On the outer aspect of the elbow was a patch of inflammation nearly the size of a hand, which pained him, and was hot to the touch; the arm was swollen from a little below the elbow up to the axilla; the inflammatory patch does not resemble acute erysipelas, and the patient declares it has not the biting, burning pain characteristic of that disease. Ordered quinia sulph., five grains, every four hours; tinct. ferri chl. and aq. ammonia, $\frac{1}{2}$ ten drops every three hours; the whole arm to be painted with tincture of iodine. His diet was to be of the most nutritious quality, and he was to receive milk-punch twice daily.

5th. Medication has apparently produced no beneficial effect, as the swelling has extended around the arm; on the inside of the arm red lines may be seen extending to the axilla; the axillary glands are enlarged, and the patient feels very weak and miserable; no fever. Treatment continued, but a lotion of liq. plumbi subacetas dil. with tinct. opii was substituted for the tincture of iodine as a local application.

6th. The inflammatory action is extending down the forearm towards the fingers, and up the arm towards the shoulder. Ordered quiniæ sulph. five grains, and tinct. ferri chl. twenty drops every three hours. Patient's countenance very anxious, tongue parched and furred, says he cannot sleep at night, has no appetite, and is commencing to emaciate rapidly.

7th. Dr. D. S. Lamb saw the patient in consultation with me. To-day the whole arm, forearm, and hand are twice the natural size, and of a reddish-purple colour; the skin and underlying tissues feel œdematosus and boggy; there is a heavy throbbing, uncomfortable sensation, but no acute or burning pain, and the epidermis is peeling off. There are, on different parts of the limbs, large blebs filled with muddy serum. It is thought that an abscess is forming near the inside of the elbow. Were it not for

the history of snake-bite it might be supposed that the case was one of phlegmonous erysipelas.

8th. The affected limb is still more swollen, as are the hands and fingers, the bitten finger feeling to the patient as if it were asleep or numb. He is very weak this morning, almost in a condition of collapse, and suffers mentally; the pulse is very slow, weak, and compressible. The same treatment to be continued, the milk-punch to be increased, and the nourishment forced.

9th. Condition about the same; opened an abscess near the elbow, which discharged nearly a pint of thin and bloody pus. Poultice of bread and milk ordered for elbow and arm. Treatment continued, but warm water dressing substituted for the tinct. opii and liq. plumbi subacetas dil.

10th. Abscess freely discharging pus and serum. Patient feels much better to-day, has a good appetite, and wants to eat. Permission given to eat anything he has a fancy for. Pulse to-day 97, and compressible. He looks bad, and is still emaciating very rapidly. His wife informed me she had given him Dover's powder at night to make him sleep, which was forbidden, as it was feared it might derange the stomach. As some doubt had been expressed as to the diagnosis of the case, Dr. Johnson Eliot was requested to see the patient, more particularly as he had observed several cases of similar nature; he unhesitatingly pronounced the symptoms identical with those of patients bitten by copperheads, and seen by him. He advised free incisions whenever there seemed a tendency to suppuration. Dr. McConnell, the microscopist of the Army Medical Museum, visited the patient this day at my request, and prepared some specimens of his blood with a view to determine whether the corpuscles were normal.

11th. Feels pretty well to-day, but had a very bad night. Pulse 88 and weak. Swelling appears to be gradually subsiding. Some small and rather superficial abscesses are on the forearm, of which a few have opened themselves, others were opened with a bistoury. As the patient complained a good deal of buzzing in the ears, he was ordered to reduce the quiniaæ sulph. to ten grains daily, the arm to be washed three or four times daily with warm water, having added to it a quantity of solution of potassa permanganate—this solution also to be sprinkled on the clothes—and poultices. The other treatment still to be continued.

12th. Is now improving greatly each day; the cavities of the abscesses on the forearm are sloughing slightly. The arm and wrist are still oedematous, but little or no pain is experienced. Dr. McConnell, who examined the blood, reports: "The blood drawn from the middle finger of the unaffected hand was, instead of the bright red of normal blood, of a brownish-red colour. On the part of the red corpuscles there was an entire absence of a disposition to form rouleaux. They were in most cases crenated [italic writer's], while in others, particularly where the corpuscles were massed, there was a tendency to fusion. The white corpuscles were relatively rather numerous and grouped. The examination was made with a one-twelfth homogeneous immersion Zeiss lens."

From this time, as the patient appeared to be gradually improving, no daily record of the case was kept. The treatment was mainly the same as has already been indicated, attention being paid to keeping up the strength. From time to time small abscesses formed, and were promptly incised. Towards the latter part of June, being obliged to leave town for a few days, the case was left in care of Dr. D. S. Lamb, who had seen

it with me a number of times. Upon my return he furnished me with the following notes :—

" During Dr. Yarrow's absence, the pulse ranged from 78 to 88. Three incisions were made, two on the back of the hand, one of which was without result: the other discharged a large quantity of pus. The third incision was on the back of the arm, and was effectual. It was noticed that a general restlessness, accompanied with loss of appetite and sleep, and an indefinable distress on the part of the patient were promptly relieved by the incisions and the resulting discharge. During this time it was found necessary to administer half-grain doses of morphia at bed-time; and also to relieve constipation by an occasional aloetic pill. The quinia was diminished to five grains, and the iron to three doses daily. A daily measurement of the arm immediately below the elbow showed a steady lessening of the swelling. The quantity of discharge also diminished. He acquired during this time considerable motion of the arm and hand, which heretofore had been almost immovable."

Upon my return I found the patient's condition considerably improved. The pulse was strong and full, colour good, tongue clean, and he is gradually regaining flesh. The forearm, wrist, and fingers are still much swollen and purplish-red in colour; and several sloughs are discharging freely. Motion at the elbow is much restricted, but pronation and supination are fairly good, says he feels more like himself, but thinks he is getting better very slowly.

A gradual but steady improvement took place with occasional relapses, and the formation of abscesses until no less than sixteen had been opened. At the time of his discharge, in August, his general condition was excellent; he had a good colour, had commenced to regain flesh, and motion was gradually being restored at the wrist and elbow-joint. The arm was still purplish-red in colour, and swollen, but all the abscess openings had healed up under simple dressing. He mentioned a curious excess of sensitiveness in the tips of the fingers of the affected limb; everything he touched seemed to be much enlarged; for instance, when he passed his fingers through his hair it felt like coarse broom-straw. I may add that this peculiar trait remained for some time. At the present time, February, the arm is entirely normal.

I have been careful to give as detailed a history of this case as was possible, for the reason that, in looking over the literature of snake-bites in this country, I have found no record of such severe symptoms, or of any lasting so long as in the one just related. In addition to this, there are other reasons which will be manifest later on.

From a great number of cases of snake-bites reported in the medical journals of this country, I have selected a few typical examples, none of which presented, however, precisely the same train of symptoms as my own. The only case of death from copperhead bite I have been able to find chronicled is by Dr. G. A. Kunkler, in the *Cincinnati Lancet and Observer*, 1859, n. s., ii. 662.

The patient, a boy aged six years, was bitten on the right foot. When seen the foot and leg were greatly swollen, the surface of the body was cold, and there were constant rigors, pulse feeble, continuous nausea. On the following day all the symptoms were much aggravated, entire extremities had swollen enormously, the foot being a shapeless mass; vesications had formed over the entire

limb, glands were swollen, and the course of the lymphatics was indicated by red lines of inflammation; there was high fever and constant delirium; diarrhoea set in. On the third day there was but little change. Inflammation extended over the groin and scrotum, and gangrene of the foot advanced with surprising rapidity. On the fourth day the patient had a convulsion and died. The treatment was as follows: A free incision was made in the wounded part, and suction was practised by an assistant, after which a solution of ten grains of iodide of potassium in one ounce of water was injected into the surrounding tissues, a ligature having been placed around the limb in the first place. Fomentations were applied over the entire limb, opium, ammonia, infusion of serpentaria, brandy, etc. etc., were employed as indication seemed to demand. The entire limb was painted with tincture of iodine. Bibron's antidote was administered internally, but apparently without effect.

In this case the patient had seemingly received so large a charge of the poison that the vital powers were completely overwhelmed, and were unable to restrict its destructive tendency.

In the *Med. and Surg. Reporter*, Phila., 1868, xix. 259, mention is made of a copperhead bite in which the patient suffered from its effects for a period somewhat shorter than in my own case.

A male, aged twelve years, was bitten on the right index finger by a copper-head snake. A tourniquet was promptly applied to the arm above the elbow, and a strong mixture of ammonia and whiskey given every few minutes, alternating with new milk. Wound was cauterized with nitrate of silver. Patient slept none the first night from excessive pain which narcotics did not control. On the following day a line of tincture of iodine was drawn around the arm at the margin of the swelling, which now extended in dark livid patches to the axilla. The soft parts became gangrenous near the wound and sloughed; there was constant nausea, pallor of the face, and loss of appetite. Two months after the patient had recovered his finger was bent towards the palm of the hand and useless. The constitutional disturbance in this case was so great as to demand the exhibition of tonics and cod-liver oil.

In the next cases, the symptoms, although severe and even alarming, were of short duration, and the patient within a comparatively brief period had apparently recovered. The first is one in which the accident took place at Potomac Landing, Virginia, a spot which is much frequented by picnickers, and which is not far distant from the locality where my patient was bitten. The history of the case is thus given by Dr. E. M. Schaeffer, *Field and Forest*, Washington, 1875, i. 12.

Patient, a male aged twenty-one, was bitten by a snake supposed to be a copperhead, June 22, 1875, on the right hand. "The wound *at once* gave him some pain, like the sting of a wasp, as he described it, and in a few minutes he began to vomit. This continued until his stomach was emptied, when he still experienced violent retching. He then became deadly faint and lay down; his companions, who had not seen the snake, laughed at his statement, saying it was a bee, and took no measures to prevent absorption of the venom by sucking or bandaging; four hours later he had been brought to Georgetown, and was first seen by a physician, Drs. L. Mackall and C. H. A. Kleinschmidt having been summoned.

"Dr. Kleinschmidt described his appearance at this time to me as that of a person in the last stages of collapse, skin cold, pulse nearly gone, respiration feeble, and pupils widely dilated, with great dimness of vision. The right hand and arm were fearfully swollen, and of a grayish-black colour resembling gangrene. Stimulants were at once rejected by the stomach, but a hypodermic injection of whiskey served to rouse him. He was conveyed to his home, and the wound,

(which was on the ulnar border of the hand, midway between the palmar and dorsal surfaces) enlarged and covered with a hot poultice, cooling applications applied to the arm, and everything done that could be suggested by all previous experience in similar cases. He passed a feverish night, but was much better on Sunday. On Monday evening I called at the house, and found him nearly free from pain, though the arm was still swollen to nearly the size of a man's thigh. From this time he progressed rapidly toward recovery, and in less than a week was out with his arm in a sling."

After having been bitten the young man attacked the serpent and stamped upon it twice before it escaped. Dr. Schaeffer visited the spot where the accident occurred the following Saturday, and found a copperhead thirty-four inches long which had recently died, and which had upon it no external marks of violence. It is fair to presume that this serpent inflicted the injury, and renders the diagnosis of the species almost certain.

The skeleton of this specimen is now in the Army Medical Museum, and upon examination it was found that two of its ribs had been broken. Considering the size of the reptile, and the delay in treatment, it is surprising that more serious results did not follow.

I should not forget to mention that this case was also reported with full details by Dr. Kleinschmidt in the Tr. M. Soc., Dist. Columbia, Wash., 1875, ii. 54.

Kunkler, whose name has already been mentioned in connection with the subject under consideration, reports another case of copperhead bite in the *Med. Counsellor*, Columbus, 1855, i. 481.

Male, bitten in August, 1853, by a large copperhead whose fangs were buried deeply in the left leg, about four inches above the ankle. He disengaged the animal with some difficulty, and when it was killed it measured two feet eight inches in length. He felt only at first a strange stinging pain, and started for home at once. In a very short time, before he had reached the house, the pain was very violent, shooting up the entire limb, and he had nausea, and was extremely faint. When Dr. Kunkler saw the patient the limb was much swollen and hot; near the spot where the fangs had entered were two "large lurid pustules." The lymphatics in the knee and groin commenced to be very painful. Pulse was small, weak, and frequent; loaded tongue, great thirst, and pain around region of the wound, with great anxiety and prostration. The treatment was as follows: Wound was carefully washed with salt water, and freely excised, then cupped. The adjoining parts were also excised and cupped. A ligature was placed below the knee, and an emetic of ipecac and tartar emetic given. Copious vomiting and purging seemed to relieve the patient. A mixture of infusion of serpentaria, carbonate of ammonia, and brandy was ordered to be given every hour. The bite was cauterized with nitrate of silver, after removal of the cup, and compresses dipped in a solution of chloride of lime were placed around the whole extremity. In the evening Dover's powder was given. The next day the patient was somewhat better, but the limb was still livid and much swollen. He was put upon a tonic and supporting plan of treatment, and gradually recovered without any serious symptoms, although the wound suppurred freely. The glands remained enlarged for some time, and the extremity was very sensitive to atmospheric changes, and some months after the accident the patient had a violent attack of sciatic neuralgia.

It is surprising, in view of the size of the reptile which inflicted the injury, and the large amount of the poison which must have been received, that a recovery took place in so short a time, and with an

almost entire absence of the very grave symptoms noticed in other cases. Dr. Kunkler, who seems to have had considerable experience in the treatment of snake-bites, says: "Without proper aid such cases generally terminate fatally within from twelve to twenty hours after being bitten." He mentions also that the Indians, who are frequently bitten, seldom die, their treatment consisting in smoking the wound, washing it with urine, placing soaked tobacco leaves upon it, giving the patient an infusion of red peppers to drink, and keeping the patient in constant perspiration.

Dr. Thomas A. Elder, of Mifflinstown, Pa., reports, in the *Med. and Surg. Reporter*, Phila., 1877, xxxvii. 118, the case of a male bitten twice on the foot by a large copperhead. A ligature had been applied below the knee, but had not been effectual in preventing the spreading of the poison into the circulation, as was shown by the rapid pulse, nervous prostration, chilliness, and nausea. The sole treatment consisted in the hypodermic injection of spts. ammon. aromat., and the internal administration of the same. The limb swelled nearly to the middle of the thigh, but the man made a rapid recovery. When the swelling subsided a peculiar bruised appearance was presented by the limb. The same gentleman reports two other cases, and states that he has treated four in all by the use of ammonia, and successfully in every instance. In one of these, which occurred in 1872, the patient was bitten early in the morning on the back of the hand by a supposed copperhead. He drank a quantity of whiskey as soon as it could be procured, and visited the doctor at 5 o'clock P. M. At this time the whole arm was swollen to an enormous extent; the skin seemed hard and thick like leather; the pulse was small, weak, rapid, and irregular; breathing laboured; and he was weak and faint. Ammonia was at once used hypodermically and internally for several days, and in less than two weeks he was entirely well, with the exception of some stiffness and soreness in the muscles.

An interesting case of copperhead bite is reported by Dr. E. P. King, in *Annalist*, n. s., 1848, ii. 229, interesting because, notwithstanding the gravity of the symptoms, the patient recovered under the use of an apparently very simple remedy.

Patient, a male, was bitten in November, on the inner surface of the left hand, by a copperhead, which had been torpid, but had recovered its activity under the influence of heat. The patient excised the wounded part, and called on the doctor about twenty minutes afterwards. The wound bled freely, but a considerable areola of inflammation existed around the part. The wound was cauterized with potassa fusa, and a ligature applied about the middle of the forearm. The man was then conveyed home, suffering greatly from nervous prostration, and nerve stimulants were exhibited. The arm became swollen in the most fearful manner, the ligature appeared as if deeply buried in the integuments, but did not affect the pulse. Below the ligature it was livid with yellow spots, but above the colour was natural. Dr. King goes on to say, that finding his patient was getting worse, he happened to recollect that indigo had been recommended in poisonous snake-bites, and at once applied a solution of it to the wound, and exhibited it internally in half drachm doses. The effect was almost magical, and the man rapidly recovered after a short time.

It should be mentioned that a second ligature had been applied higher up the limb, and was kept on for an entire day, and it is barely possible that this admitted the poison in such small doses to the system that eventually its violence was destroyed. Dr. King, however, considers the indigo as a specific.

Another case of copperhead-bite is reported by Dr. L. B. Kline, *Med. and Surg. Reporter*, Phila., 1868, xix. 326, in which the patient, a girl of thirteen years, received no less than three wounds on the right instep. There was much swelling and great pain. A ligature had been applied by the family. Whiskey and ammonia were given for several days, and a poultice of wild indigo leaves applied to the part. She almost recovered in two weeks time without any untoward symptoms.

Dr. N. Harris Moragne reports a case of copperhead-bite in *South. Med. and Surg. Journal*, Augusta, 1853, n. s., ix. 81, in which the inside of the foot of the patient was bitten on the 21st of June, 1852, and in a short time he became delirious, with a hot dry skin, and a pulse ranging from 100 to 120; the left leg and ankle were enormously swollen. A ligature was applied, poultices were placed upon the wound, and olive oil and ammonia were administered internally. Notwithstanding the treatment, the patient continued very sick, until the 24th, when free perspiration took place, he became rational, the tumefaction gradually subsided, and in a short time he was entirely well.

I was informed some years ago by a Mr. Elliott, one of the early settlers of Illinois, of a case of copperhead-bite, which occurred upon his farm, and in which the dangerous symptoms showed themselves at a very early period, the patient's arm swelled frightfully, and became mottled, and delirium rapidly supervened. The only remedy administered was melted lard, of which the patient was forced to drink over a pint. He made a rapid and satisfactory recovery.

The symptoms of the bite of the moccasin, *Ancistrodon piscivorus* are very similar to those of the *A. contortrix*, but it is noticed that several authors in reporting cases speak of the great extravasation of blood which takes place in the neighborhood of the affected part. One very interesting case is reported by Dr. P. Owen, in the *New Orleans Med. and Surg. Journal*, 1867, xx. 207.

The patient, a female, was bitten Saturday, June 22, 1867, just above the right ankle, by a snake supposed to be a moccasin. When seen she was in a state of great nervous excitement, tongue coated and dry, skin cold and clammy. Affected limb was enormously swollen and mottled with extravasated blood, which mottled appearance extended in spots over the entire body, resembling a case of purpura. The limb was cold, and she suffered agonizing pain in it, which extended, as the patient declared, to the heart, and so great was the sense of constriction that she was in constant dread of death. There were hemorrhages from the skin, the nose, the mouth, the lungs, the vagina, and uterus, and at times she vomited and purged blood, also passing it in her urine. The wound had been scarified shortly after its reception, and bled freely, and whiskey, ammonia, valerian, and camphor were freely given. Sunday, June 23d, the condition of the patient was about the same, but there was retention of urine. Ammonia was stopped, and twenty drops of oil of turpentine were given every two hours. On Monday, the 24th, the pulse was 140, tongue moist, bowels moved several times, stools bloody, hemorrhages from the mouth, lungs, womb, etc. not so often or profuse as the day before. A quart of bloody urine was drawn off with a catheter. Tuesday, 25th, pulse 120; mottled spots beginning to fade on the face and neck; no hemorrhage except from nose. Urine now clear. General condition much improved. The improvement was gradual, but retention of urine continued for some time, and on July 10th, at which time she was discharged, nothing remained but stiffness, yellowness, and swelling of the leg.

In this particular case, of which the details have been fully given because of their grave interest, it is surprising that recovery took place, for in

no case reported, except one or two of rattlesnake bite, has any mention been made of the purpuric spots and repeated hemorrhages. It may be that the patient was bitten by a rattlesnake, and did not recognize the reptile, although it would seem that its crepitulation should have indicated its near proximity.

The most interesting and singular fact in connection with the bites of some poisonous reptiles is the tendency to a recurrence of certain symptoms at varying periods after a lapse of many years, and I have selected a few such cases. One is reported by Dr. Sweeney, of Rushville, Illinois, in *Cin. Lancet and Obs.*, 1860, n. s., iii. 318, as follows:—

"Mr. DeCamp, of this county, was bitten by a copperhead snake in the State of Pennsylvania, thirty years ago; he was treated at the time by his neighbours; whiskey was the only remedy used. His health, from the time of his recovery from the effects of the bite, was pretty good until 1857, about the same time of year he was bitten, when he broke the skin on the back of the hand that had been bitten so many years ago. Inflammation set in with pain, uneasiness of the stomach, delirium, and spots over the general surface the colour of the snake. Remedies were tried without relief. It was suggested to him by a friend, on seeing the spots on the skin, to try the 'whiskey practice.' By its free use he was soon relieved of the general symptoms, but still experienced slight uneasiness in the whole arm, and particularly the middle fingers of the hand, which had originally received the injection of the snake-poison, till the winter of 1858, when contraction of the fingers came on, with pain through the whole course of the arm and to the chest. The general health became bad, but has since improved. The fingers remain contracted and the whole arm much weakened."

Three cases somewhat similar to the above are reported by Dr. Wm. Stockbridge in the *Boston Med. and. Surg. Journal*, 1843, xxix. 40.

Case 1st. Male, aged ten, bitten on the leg by a copperhead. Leg became very much swollen and painful in half an hour, with high irritative fever. There was no medical aid at hand, and the foot and leg were simply immersed in hot brine, after which a decoction of cotton wood was applied to the wound, and taken internally. The patient recovered, but the wounded part sloughed freely. For eighteen years subsequently, he has had an annual recurrence of the symptoms, attended with severe pain similar in character to that experienced when first injured, but this is unaccompanied by any swelling. It occurred precisely at the same time every year, but gradually decreased in intensity. The doctor says: "A singular circumstance relative to the location of these annual pains was, that for several years it was confined to the knee of the limb bitten; in a few years it left the knee and seized the hip, and finally it attacked the shoulder, the last time being very slight."

Case 2d is of a female slave bitten ten years since by a moccasin (*Ancistrodon piscivorus*) who suffered from the usual symptoms of snake-bite, and every year up to the present time they have returned with greater or less intensity, but the swelling does not return.

Case 3d. A lady was bitten, and the usual symptoms followed. For twelve years she had a recurrence of painful symptoms on the bitten limb at the time of year corresponding with the time she received the wound.

In the *Virginia Clinical Record*, 1872-3, ii. 137, Dr. R. T. Coleman relates a case of snake-bite, followed in the course of a year by a scaly eruption upon the legs which resembled ichthyosis.

The patient was bitten on the right index finger by a small moccasin, and reported at once; a piece of tape was tied tightly around the finger above the bite,

and as no untoward symptoms seemed to develop, the tape was taken off in about half an hour. In less than five hours the arm had swollen to double its size, he suffered intense pain, and his pulse could be felt as a mere thread. He had whisky administered to him from time to time until he had taken five quarts, and finally recovered, but the tip of the finger sloughed off, and he had in the following spring the eruption already alluded to. Dr. Coleman states: "This very eruption I met with once before in a man who traced it to the poison of a snake-bite, and with him it recurred a number of successive springs. This tendency to a return of both animal and vegetable poisons in the spring of successive years is a remarkable but unexplained phenomenon."

That serpents of the genus *Ancistrodon* are not the only ones whose poison seems to act in the manner related, the following case, reported in the *Med. Record*, N. Y., 1875, x. 62, by Dr. H. G. Piffard, would seem to prove:—

The patient, a female aged nineteen, had been bitten on the right thumb by a rattlesnake six years before the doctor saw her. He found an eruption of small vesicles upon the integument lying between the metacarpal bones of the thumb and index finger. She had had a similar eruption every three months. The case was lost sight of for some time, but about a year since the doctor again saw her, and was informed that for the last three or four years the vesicles had not occurred with their former regularity, and that during the last seven or eight months there had been no recurrence of the vesicles.

Dr. Piffard believes that the lesions and symptoms shown by his patient were entirely dependent upon neurotic influence, and considers the case unique, as it is with some qualification, but he states that the periodical neuralgias which are said to follow the infliction of wounds by the felinae bear some resemblance to it. Dr. Livingston, the African explorer, mentions that a wound from a lion's tooth is generally followed by great sloughing and discharge, and pains are felt in the part periodically ever afterwards.

The case of Mr. Shindler, bitten by an elaps, or Florida harlequin snake, at the National Museum, over a year since, affords another illustration of the apparent recurrent virulence of snake-poison, for, although he made a good recovery from the injury, in a little over a year he was troubled with considerable pain in the finger which had been bitten, and a small abscess formed and went on to suppuration. It will be an interesting case to watch, and ascertain if each succeeding year he is troubled in the same manner. Just why these periodical occurrences should take place seems hard to explain. Can it be that, as in herpes, and other diseases of neurotic origin, the nervous system retains in a latent form a peculiar septic influence, which may at certain periods, under certain conditions, be awakened into temporary activity? Such a theory might account perhaps for a return of symptoms at varying periods, but cannot explain what seems to be absolute periodicity such as we have accounts of and have seen develop after serpent-bite. We know that in cases of malarial poisoning peculiar effects are produced at particular times, with great regularity, but just how these effects are produced, or why, we do not know. In the case of recurring anniversary symptoms, it would be quite

natural to suppose that the patient remembering what must have been a very painful experience a year or so before, should be in a condition of nervous hyperesthesia to a greater or less degree, especially if gifted with a sensitive imagination; might not this have something to do with a development of symptoms? Again, at the particular time on or about the anniversary of his accident, the telluric conditions might be such as to produce neuralgic or other symptoms; and lastly we should not forget to eliminate from the well-authenticated cases such as are partly the result of an evolution from inner consciousness.

In recording the history of these cases and my own, there are certain points of interest which should be mentioned if only briefly.

In the case of the patient whose accident has given origin to this paper, nearly all of the symptoms which are generally expected to be met with in snake-bite were present, but it is rather odd that there were no local manifestations in the immediate vicinity of the injury. With the exception of a slight numbness, there was no sign of inflammation, no swelling, and at no time did suppuration occur in the finger. The venom apparently was conveyed to the neighbourhood of the elbow, and from this nidus then extended down and up the arm, producing the cellulitis which caused so much suffering and so much damage to the soft parts. Another point of interest in the case is the report of Dr. McConnell as to the appearance of the blood corpuscles under the microscope, which shows that the conclusions of Dr. Isaac Ott, of Easton, Pennsylvania, and his own are very different. Dr. McConnell visited the patient, and prepared his slides with that care for which he is celebrated, taking the blood he proposed to examine from the middle finger of the unaffected hand. He states emphatically that most of the red corpuscles were crenated, and that the white corpuscles were relatively few in number. Dr. Ott, however, in the *Virginia Medical Monthly*, February, 1883, states positively that "the blood after copperhead poisoning shows no microscopic changes of its globules, and no difference in its spectrum." Further examinations will perhaps confirm the statements of one or the other of these gentlemen.

Dr. Ott, who has made a special study of the venom of the copperhead, comes to the following conclusions:—

1. The venom of the copperhead is weaker in toxic activity than that of the rattlesnake.
2. The heart, with both kinds of venom, becomes greatly prostrated, and in rapid deaths is the main cause.
3. The venom of either snake does not affect the sensory nerves.
4. The sensory centres are affected by both venoms.
5. The muscular excitability continues to be little affected at the time of death by the poison of the copperhead.
6. The two venoms greatly resemble each other in physiological activity.
7. The cardiac force, rhythm, and frequency are lowered by both venoms.
8. The arterial tension is greatly lowered by both venoms.
9. The blood, after copperhead poisoning, shows no microscopic changes of its globules, and no difference in its spectrum.

In the main I am disposed to agree with this gentleman, except so far as the last of his conclusions is concerned, but on this point I should want additional evidence. Weir Mitchell, to whom we are indebted for most valuable researches in serpent venom, declares the blood corpuscles after venom poisoning are unaltered, although in some chronic cases he has observed a disintegration of their edges. Prof. George B. Halford, of the University of Melbourne, maintains that an enormous increase of the white corpuscles takes place after poisoning by serpent venom, and attributes the change to a germinal matter, consisting of nuclei one-four-thousandth of an inch in diameter, originating from the snake's glands. Dr. J. B. de Lacerda, of Rio Janeiro, announces that the blood of a serpent-poisoned animal presented the following phenomena: The red corpuscles began by presenting little shining points, which increased until the globule broke down, and was replaced by numerous ovoid corpuscles, very brilliant, and possessed of oscillatory movements.

Within the last few years an increased interest has been taken as to the action of reptile venom, and it may be proper in connection with the case briefly to allude to the more recent researches upon the subject, which have been carefully summarized by Dr. Robert Fletcher, of the Surgeon-General's Office, in a paper entitled "A Study of some Recent Experiments on Serpent Venom," published in the July number of the *American Journal of the Medical Sciences*, for 1883. From this paper I have extracted much valuable matter, which is included in quotation marks. In regard to Dr. Mitchell's conclusions regarding *crotalus* venom, he states as follows: "Venom is harmless when swallowed: 1st. Because it is incapable of passing through mucous surfaces. 2d. Because it undergoes some change in the process of digestion, which allows it to enter the blood as a harmless substance, or to escape from the intestinal canal in an equally innocent form." "The venom passes by endosmosis through serous membranes with great rapidity." A drop of venom being placed in a loop of the peritoneum, in about a minute a sudden emptying of blood corpuscles took place at the bifurcation of a capillary vessel, followed by a like occurrence at other parts. The same took place when the bared surfaces of muscles were similarly poisoned. "This action, together with the defect of coagulability of the poisoned blood, accounts for the excessive hemorrhage about fang wounds. In acute poisoning, where death rapidly ensues, the coagulability of the blood is not generally impaired, but where the symptoms are prolonged the blood after death does not coagulate." In connection with this I may mention that it was a matter of some surprise to Dr. Lamb and myself to notice, after the numerous abscesses in our patient's arm had been opened, how freely the blood flowed from the most superficial incisions.

"The cause of death in acute poisoning of warm-blooded animals is

the cessation of respiration from paralysis of the nerve centres. The heart is enfeebled, but not paralyzed. In chronic or secondary poisoning the rapid decomposition of the blood, and of the tissues locally acted upon, leaves no doubt that serpent venom is a septic or putrefacient poison of astounding energy." The experiments of Sir Joseph Fayrer, the celebrated English surgeon, who has studied with so much care the serpents of India, seem to confirm most of Dr. Mitchell's conclusions regarding the mode of action and effects of serpent venom, but in one important particular they are widely divergent. Fayrer asserts very positively that "snake-poison is deadly when applied to a mucous membrane, to the stomach, or conjunctiva." He says also that the "blood of an animal that has died from snake-poisoning is itself poisonous;" but for a discussion of the points involved the reader is referred to Dr. Fletcher's paper.

In 1879 and 1880, Dr. Lacerda, whose name has already been mentioned, resumed a series of experiments with serpent venom, commenced several years before. Injections were made into the different tissues of the body with poison from the *Bothrops*, and the following results obtained: "Wherever injected, unless there was vascular rupture or an antecedent wound, there were no signs of the poison having entered the blood. On the contrary, local evidences of inflammation were invariably produced, often of great intensity, such as phlegmonous abscess, meningitis, encephalitis, acute pleurisy, or pneumonia." The lung tissue seemed to be the most sensitive to the poison, and deaths followed almost as quickly as when the poison was injected into the blood. The poison was most slowly absorbed by the intestines, and the stomach seemed almost insensible to its effects.

Within a year a new reptilian venom has been investigated by Drs. S. Weir Mitchell and Edward T. Reichert—that from the salivary glands of *Heloderma suspectum*, Cope, the Gila monster of New Mexico and Arizona. These gentlemen have come to the following conclusions: "The poison of *Heloderma* causes no local injury. It arrests the heart in diastole, the organ afterwards contracting slowly; the heart loses its irritability to electric stimuli at the time it ceases to beat; the other muscles and nerves respond readily to irritants; the spinal cord has its power annihilated abruptly, and refuses to respond to the most powerful electric currents." It will be seen by this that the *Heloderma* venom acts in strong contrast to serpent venom, for the latter produces local hemorrhages, and causes death, through failure of the respiration chiefly, and does not affect the heart, unless an overwhelming charge is received, nor is there abrupt loss of spinal power.

Having gone over the work of recent investigations regarding the effects of serpent venom, it may not be deemed inappropriate to devote some space to the means and remedies to be employed in cases of snake-bite.

To most intelligent observers of such an accident, the indication would doubtless be to prevent the entrance of the poison into the general circulation by means of a ligature or bandage, which should not be narrow, but quite broad and applied above the bite, or between it and the heart, it being of course understood that these remarks, as far as ligatures are concerned, apply to wounds of limbs. The bite should then be laid open by a crucial incision, care being taken not to injure bloodvessels; and suction should be made either by the mouth (in case no abrasions exist) or by cupping; this latter procedure may be made by means of ordinary surgical cups if available, by a small tumbler or wineglass from which the air has been exhausted by burning a small quantity of alcohol or spirits therein, or by means of an ordinary wide-mouthed bottle or can in which boiling hot water should be poured and quickly emptied. Alcoholic stimulants should be given in order to keep up the flagging heart, and the band should be loosened for a few moments at a time, in order that only a small amount of the venom shall enter the circulation. This process should be repeated, and the pulse will indicate when the proper amount of stimulants has been reached. It is not necessary to produce drunkenness, as it is believed that in some cases, especially of children, death has resulted, not from the snake venom, but from lethal doses of alcohol. In view of the recent researches of Lacerda, mentioned in the able paper by my friend Dr. Fletcher, from which I have so liberally quoted, the solution of potassa permanganas should be employed as an injection in the immediate vicinity of the bite. The strength should be a one per cent. solution of the salt in water, and, as the remedy is a chemical and not a physiological antidote, it is necessary that contact with the venom should quickly take place. In a number of experiments made by Dr. Lacerda, even when serpent venom was injected into veins followed by the permanganate, the salt was an effective antidote. As to the many reputed antidotes, Weir Mitchell has clearly proved that little or no reliance can be placed on them, and although it is not decided whether the formerly much-vaunted Bibron's antidote may not have some power to check, for a time, the dangerous symptoms, he thinks further experience will be necessary to decide upon its merits. Of course, after the acute symptoms of snake-bite have subsided, others would have to be treated according to the general indications. To those interested in the subject of antidotes and remedies for serpent-bites I would suggest an examination of the very valuable and exhaustive paper by Dr. Mitchell in the *North American Medico-Chirurgical Review*, 1861, v. 262.

Some apology is perhaps necessary for the length of this paper, but it is hoped that the importance of the subject may be a sufficient excuse, and that physicians throughout the country may be induced to record not only their successful cases, but those in which medical skill has proved unavailing.